

# Beechcraft Model 18

Model 18



Instructor and pilot in a **Beechcraft AT-7** doing navigation training at Kelly Field, TX.

<b>Role</b>	Trainer & Utility aircraft
<b>National origin</b>	United States
<b>Manufacturer</b>	Beech Aircraft Corporation
<b>First flight</b>	15 January 1937
<b>Introduction</b>	1937
<b>Primary users</b>	United States Army United States Navy Royal Air Force
<b>Produced</b>	1937-1970
<b>Number built</b>	More than 9,000 of 32 variants built
<b>Unit cost</b>	1952 \$78,050.00 (USD)

The Beechcraft Model 18, or "Twin Beech", as it is better known, is a 6-11 seat, twin-engine, low-wing, conventional-gear aircraft that was manufactured by the Beech Aircraft Corporation of Wichita, Kansas. This model saw military service during and after World War II in a number of versions including the United States Army Air Forces (USAAF) C-45 Expeditor, AT-7 Navigator, AT-11 Kansan; and for the United States Navy (USN), UC-45J Navigator and the SNB-1 Kansan.

The Beech 18 is the most modified U.S.-certified aircraft design, with over 200 Federal Aviation Administration (FAA) approved Supplemental Type Certificates (STCs) on record for the aircraft.

In addition to carrying passengers the aircraft's uses have included aerial spraying, sterile insect release, fish seeding, dry ice cloud seeding, aerial firefighting, airborne mail pick up and drop, ambulance service, numerous movie productions, skydiving, freight, gun- and drug-smuggling, engine test bed, skywriting and banner towing. The Model 18 was the first aircraft flown by Philippine Airlines, Asia's first and oldest airline. Many are now in private hands as prized collectibles.

## **Design and development**

By the late 1930s, Beechcraft management speculated that a demand would exist for a new design dubbed the Model 18 which would have a military application, and increased the main production facilities. The design was mainly conventional for the time, including twin radial engines, all-metal semi-monocoque construction with fabric covered control surfaces and "tail dragger" undercarriage, while less common were the twin tail fins. Upon an immediate glance they can be mistaken for the larger Lockheed Electra series of airliners which closely resemble the Model 18. Early production aircraft were either powered by two 330 hp (250 kW) Jacobs L-6s or 350 hp (260 kW) Wright R-760Es. The 450 hp (336 kW) Pratt & Whitney R-985 became the definitive engine from the prewar C18S onwards. The Beech 18 prototype first flew on 15 January 1937.

At the time of the Pearl Harbor attack, the Beech 18 was outsold by the Lockheed 12 by 2-to-1. However, war priorities forced Lockheed to concentrate on its heavier aircraft, and Beechcraft received a major boost through wartime contracts surrendered by Lockheed.

The aircraft has used a variety of engines and has had a number of airframe modifications to increase gross weight and speed. At least one aircraft was modified to a 600 hp (447 kW) Pratt & Whitney R-1340 power plant configuration. With the added weight of approximately 200 lb. (91 kg) per engine, the concept of a Model 18 fitted with R-1340 engines was deemed unsatisfactory due to the weakest structural area of the aircraft being the engine mounts. With the exception of the

center truss (the central component around which the entire aircraft is built), nearly every airframe component has been modified at one time or another.

In 1955 deliveries of the Model E18S commenced; the E18S featured a fuselage that was extended 6 inches (150 mm) higher for more headroom in the passenger cabin. All later Beech 18s (sometimes called Super 18s) featured this taller fuselage and some earlier models (including one AT-11) have been modified to this larger fuselage. The Model H18, introduced in 1963, featured optional tricycle undercarriage. Unusually, the undercarriage was developed for earlier-model aircraft under an STC by Volpar, and installed in H18s at the factory during manufacture. A total of 109 H18s were built with tricycle undercarriage, and another 240 earlier-model aircraft were modified with the undercarriage.

Construction of the Beechcraft Model 18 ended in 1970 with the last, a Model H18, going to Japan Airlines. Beechcraft set a record that still stands today for longest continuous production of a piston engine aircraft. Through the years, 32 variations of the basic design had flown, over 200 improvement modification kits were developed, and almost 8,000 aircraft had been built. Some aircraft were almost unrecognizable as having originated as a Beech 18. In one case the aircraft was modified to a triple tail, tri-gear, hump backed configuration and appeared similar to a miniature Lockheed Constellation. Another distinctive conversion was carried out by PacAero as the Tradewind. This featured a lengthened nose to accommodate tricycle undercarriage, and the Model 18's twin tails replaced with a single fin.

## **Operational history**

Production got an early boost when Nationalist China paid the company US\$750,000 for six M18R light bombers, but by the time of the U.S. entry into World War II, only 39 Model 18s had been sold, of which 29 were for civilian customers. Work began in earnest on a variant specifically for training military pilots, bombardiers and navigators. The effort resulted in the Army AT-7 and Navy SNB. Further development led to the AT-11 and SNB-2 navigation trainers and the C-45 military transport. The United States Air Force Strategic Air Command had Beechcraft Model 18 (AT-11 Kansans, C-45

Expeditors, F-2 Expeditors (the "F" standing for "Foto-recon"), and UC-45 Expeditors) from 1946 until 1951. From 1951 to 1955 the USAF had many of its aircraft remanufactured with new fuselages, wing centre sections and landing gear to take advantage of the improvements to the civil models since the end of World War II. Eventually 900 aircraft were remanufactured to be similar to the then-current Model D18S and given new designations, constructor's numbers (c/nos.) and Air Force serial Numbers (s/nos). The USN had many of its surviving aircraft remanufactured as well, these being redesignated as SNB-5s and SNB-5Ps. The C-45 flew in US Air Force service until 1963; the USN retired their last SNB in 1972 while the U.S. Army flew their C-45s through 1976. In later years the military called these aircraft "bug smashers" in reference to their extensive use supplying mandatory flight hours for desk-bound aviators in the Pentagon.

Some of the modifications created by independent engineering entrepreneurs were adopted in concept by the factory in later production versions in similar fashion to the current practice Harley Davidson copying of custom motorcycles built in the 1960s and 1970s. Among the most notable cooling air and exhaust modifications were those engineered by Benjamin Israel while employed by Conrad Conversions. His modifications were based largely on creating a more efficient use of cooling air to reduce drag, a major detriment to cruise performance. Cruise performance was improved 10% or more at the same power settings as before the modifications. These modifications were largely copied on the factory produced G and H models. Beech 18s were used extensively by Air America during the Vietnam War; initially more-or-less standard ex-military C-45 examples were used, but then the airline had 12 aircraft modified by Conrad Conversions in 1963 and 1964 to increase performance and load-carrying capacity. The modified aircraft were known as Conrad Ten-Twos, as the maximum take-off weight (MTOW) was increased to 10,200 lb. (4,600 kg). The increase was achieved by several airframe modifications, including increased horizontal stabilizer angle-of-incidence, redesigned landing gear doors, and aerodynamically-improved wing tips. Air America then had Volpar convert 14 aircraft to turboprop power, fitted with Garrett AiResearch TPE-331 engines; modified aircraft were called Volpar Turbo Beeches and also had a further increase in MTOW to 10,286 lb. (4,666 kg).

A factory option at one point was the addition of JATO bottles on each engine nacelle which added the equivalent of 200 horsepower (150 kW) per engine for about 12 seconds. The most successful power plant upgrade was that of the Pratt & Whitney Canada PT6 turbine engine and Hartzell propeller. This conversion was carried out by Hamilton Aircraft in the 1960s and 70s as the Hamilton Westwind, successfully extending the commercial life of the aging aircraft. The Westwind II added a fuselage stretch to provide seating for 17 passengers, the Westwind III seated eight and used the remainder of the extra room for cargo, and the Westwind IV added an extra stretch and a large cargo door.

## **Spar Problems**

The wing spar of the Model 18 is fabricated by welding an assembly of tubular steel. The configuration of the tubes and inadequate corrosion inhibitors, along with holes from after-market STC modifications have allowed the spar to become susceptible to corrosion and cracking while in service. This prompted the FAA to issue an Airworthiness Directive in 1975, mandating the fitment of a spar strap to Model 18s. This led in turn to the retirement of a large number of Model 18s when owners determined that the aircraft were worth less than the cost of the modifications. Further requirements have been mandated by the FAA and other national airworthiness authorities, including regular removal of the spar strap to allow the strap to be checked for cracks and corrosion and the spar to be X-rayed. In Australia the airworthiness authority has placed a life limit on the airframe, beyond which aircraft are not allowed to fly.



## **MAPS Aircraft**

The MAPS Museum's Beech was built in 1943 as a Beech AT-7. The construction number was 5479 and its USAAF serial number of 43-33316. It was delivered to the USAAF Navigation Training School at San Marcos, Texas on 26 October 1943. The cost of construction was \$59,579. It spent the war years as a navigation trainer. The aircraft was outfitted with navigation equipment for three students on the right-hand side of the cabin.

The Beech was transferred to the U.S. Navy on December 31, 1945. At this point, it was designated an SNB-2 and assigned the BuNo 677103. On January 2, 1946, the SNB was assigned to NAS Corpus Christi, Texas. On July 30, 1946, the Beech was transferred to NAS Olathe, Kansas. In 1948 the plane was based a NAS Norfolk, Virginia, before being transferred to FASRON (Fleet Air Support Squadron) 103 at NAS Atlantic City, New Jersey in August of 1948.

Somewhere between February 1949 and August 1951 the SNB was returned to Beech and re-manufactured into a post-war D-18S model. As part of the rebuild, the aircraft was given new wing center section, fuselage, landing gear, breaks and tail wheels. The engines, propellers, tail section, outer wings and some interior equipment were refurbished and returned to the aircraft. After this process, what emerged was basically a zero-timed, new aircraft. The aircraft was given a new Beech serial number of N790.

On August 6, 1951, the Beech, now designated as a SNB-5, was delivered to the U.S. Navy. By April of 1952, the plane had been transferred to the Marines and was now operated by the Pacific Division Headquarters of the Fleet Marine Force Headquarters and Maintenance Squadron. In 1962, the Department of Defense implemented a new unified system of aircraft designation so the SNB became a UC-45J. In the late 1960's, the C-45 was dropped from the USN inventory and was assigned to the U.S. Army. While operated by the U.S. Army, the plane retained the U.S. Navy serial number. By early 1971, the plane was placed in storage at Davis-Monthan AFR, Arizona.

On August 3, 1971, the aircraft was donated to the University of Kansas and registered as N200KU. The aircraft's civilian Certificate of Aircraft Registration was issued on December 17, 1971. The cost of the donation was listed as \$75,000. The aircraft was used for a variety of research projects, mainly consisting of photo mapping. On October 17, 1973, the aircraft was substantially damaged in a wheel-up landing at Lawrence, Kansas. The plane was repaired shortly afterwards.

On September 5, 1984 it was registered to the Military Aircraft Restoration Corporation. The plane was placed on loan to the Combat

Aircraft Museum in Topeka, Kansas for a short time before it was flown to MAPS in 1990.

## **Variants**

### **Manufacturer Models**

Unless otherwise noted, the engines fitted are Pratt & Whitney R-985 radials.

#### **Model 18A**

- First production model with seating for two pilots and seven or eight passengers, fitted with Wright R-760E-2 engines of 350 horsepower (260 kW). MTOW: 6,700 lb. (3,000 kg).

#### **Model S18A**

- Version of Model 18A capable of being fitted with skis or Edo 55-7170 floats; MTOW: 7,200 lb. (3,300 kg).



Beech 18 on floats in Manitoba, 1986

#### **Model 18B**

- Improved model with increased range and useful load, fitted with 285 hp (213 kW) Jacobs L-5 engines.

#### **Model S18B**

- Version of Model 18B capable of being fitted with skis or floats.

#### **Model 18D**

- Variant with seating for two pilots and nine passengers, fitted with Jacobs L-6 engines of 330 horsepower (250 kW). MTOW: 7,200 lb. (3,300 kg).

#### **Model S18D**

- Version of Model 18D capable of being fitted with skis or Edo 55-7170 floats; MTOW: 7,170 lb. (3,250 kg).

### **Model A18D**

- Variant of 18D with MTOW increased by 300 lb. (140 kg) to 7,500 lb. (3,400 kg), fitted with Pratt and Whitney R-985 engines with 450 hp each.

### **Model SA18D**

- Seaplane version of Model A18D but same MTOW as S18D fitted with Edo 55-7170 float.

### **Model A18A**

- Version fitted with Pratt and Whitney R-985 engines of 450 horsepower (340 kW). MTOW: 7,500 lb. (3,400 kg).

### **Model SA18A**

- Seaplane version of Model A18A, fitted with Edo 55-7170 floats; MTOW: 7,170 lb. (3,250 kg).

### **Model 18R**

- Model with Pratt and Whitney R-985-A1 engines with dual stage blower for increased power at higher operating altitudes. 450 horsepower (340 kW); seven built, one to Sweden as an air ambulance, six to Nationalist China as **M18R** light bombers.

### **Model 18S**

- Nine-passenger pre-World War II civil variant, served as basis for USAAF C-45C.

### **Model B18S**

- Nine-passenger pre-World War II civil variant, served as basis for USAAF F-2.

### **Model C18S**

- Variant of B18S with seating for eight passengers, and equipment and minor structural changes.

### **Model D18S**

- First post-World War II variant introduced in 1945 with seating for eight passengers and MTOW of 8,750 lb. (3,970 kg). 1,035 built.
  - **3N**: Version of D18S delivered to the Royal Canadian Air Force (RCAF); 100 built.
  - **3NM**: Version of D18S delivered to the RCAF; 133 built.
  - **3TM**: Version of D18S delivered to the RCAF; 48 built.



### **Model D18C**

- Variant with Continental R9-A engines of 525 horsepower (391 kW) and MTOW of 9,000 lb. (4,100 kg), introduced in 1947. 31 built.

### **Model E18S**

- Variant with redesigned wing and MTOW of 9,300 lb. (4,200 kg); 403 built.

### **Model E18S-9700**

- Variant of E18S with MTOW of 9,700 lb. (4,400 kg); 57 built.

### **Model G18S**

- Superseded E18S, MTOW of 9,700 lb. (4,400 kg); 155 built.



1959-built G18S in 2011

### **Model G18S-9150**

- Lightweight version of G18, MTOW of 9,150 lb. (4,150 kg); 1 built.

### **Model H18**

- Last production version, fitted with optional tricycle undercarriage developed by Volpar and MTOW of 9,900 lb. (4,500 kg); 149 built, of which 109 were manufactured with tricycle undercarriage.

## **Military versions**

### **C-45**

- Six seat staff transport based on **C18S**; 11 built.

### **C-45A**

- Eight seat utility transport based on **C18S**; 20 built.

### **RC-45A**

- Re-designation of all surviving F-2, F-2A and F-2B aircraft by the USAF in 1948.

#### C-45B

- Based on **C18S** but with modified internal layout; 223 ordered. Re-designated **UC-45B** in 1943.
  - **Expeditor I**: Some C-45Bs were supplied to the RAF under Lend-Lease.

#### C-45C

- Two **Model 18S** aircraft impressed into the USAAF. Re-designated **UC-45C** in January 1943.

#### C-45D

- Designation given to two **AT-7** aircraft converted as passenger transports during manufacture. Re-designated **UC-45D** in January 1943.

#### C-45E

- Designation given to two **AT-7** and four **AT-7B** aircraft converted as passenger transports during manufacture. Re-designated **UC-45E** in January 1943.

#### C-45F

- Standardized seven-seat version based on **C18S**, with longer nose than preceding models; 1,137 ordered. Redesignated **UC-45F**.
  - **Expeditor II**: C-45Fs supplied to the RAF and Royal Navy under Lend-Lease.
  - **Expeditor III**: C-45Fs supplied to the RCAF under Lend-Lease.

#### C-45G

- **AT-7s** and **AT-11s** remanufactured in early 1950s for the United States Air Force (USAF) to similar standard as civil **D18S** with autopilot and R-985-AN-3 engines; 372 aircraft rebuilt.

#### TC-45G

- Multi-engine crew trainer variant of C-45G; **AT-7s** and **AT-11s** remanufactured in early 1950s for the USAF to similar standard as civil **D18S**. 96 aircraft rebuilt.

#### C-45H

- **AT-7s** and **AT-11s** remanufactured in early 1950s for the USAF to similar standard as civil **D18S**, with no autopilot and R-985-AN-14B engines; 432 aircraft rebuilt.



C-45H/AT-7 CAF

**TC-45H**

**RC-45J**

- In 1962 all surviving US Navy SNB-5Ps were re-designated RC-45J.

**TC-45J**

- In 1962 all surviving US Navy SNB-5s were re-designated TC-45J.

**C-45J**

**AT-7 Navigator**

- Navigation trainer based on **C18S**, with an astrodome and positions for three students. Powered by 450 hp (336 kW) R-985-25 engines; 577 built.



Beechcraft AT-11 over the west Texas prairies, c. 1944.

**AT-7A**

- Floatplane version of **AT-7**; six built.

### **AT-7B**

- Winterized **AT-7**; nine built.

### **AT-7C**

- Based on **C18S** with R-985-AN3 engines; 549 built.

### **AT-11 Kansan**

- Bombing and gunnery trainer for USAAF derived from **AT-7**. Fuselage had small circular cabin windows, bombardier position in nose, and bomb bay; fitted with two machine guns, one in nose and one in a dorsal gun turret. 1,582 built for USAAF orders, with 24 ordered by Netherlands repossessed by USAAF and used by the Royal Netherlands Military Flying School at Jackson, Mississippi.

### **AT-11A**

- Conversion of AT-11 as navigation trainer; 36 converted.

### **CQ-3**

- Conversion of UC-45F modified to act as drone control aircraft. Re-designated as **DC-45F** in June 1948.

### **F-2**

- Photo-reconnaissance version based on **B18**.

### **F-2A**

- Improved version.

### **F-2B**

### **JRB-1**

- Photographic aircraft for the US Navy, based on the **C18S**, fitted with fairing over cockpit for improved visibility. 11 built.

### **JRB-2**

- Light transport for the US Navy, based on the **C18S**; 15 built.

### **JRB-3**

- Photographic version, similar to **C-45B**; 23 built.

### **JRB-4**

- Utility transport version, equivalent to **UC-45F**; 328 built.

### **JRB-6**

### **SNB-1**

- Variant for the US Navy, similar to **AT-11**; 110 built.

### **SNB-2**

- Navigation trainer for the US Navy. Similar to **AT-7**; 299 built.

### **SNB-2C**

- Variant for the US Navy, similar to **AT-7C**.

### **SNB-2H**

- Ambulance conversion for the US Navy.

### **SNB-2P**

- Photo reconnaissance trainer for the US Navy.

### **SNB-3**

- Variant for the US Navy, similar to AT-7C.

### **SNB-3Q**

- Electronic counter-measures trainer for the US Navy.

### **SNB-5**

- SNB-2s and SNB-2Cs were remanufactured, and designated SNB-5 by the US Navy.

### **SNB-5P**

- Photographic-reconnaissance trainer for the US Navy.

### **Conversions**

#### **Super 18S Tradewind**

- Custom conversion of Beech D-18S/C-45 to 5-11 seat executive transport by Pacific Airmotive.

#### **Hamilton HA-1**

- Conversion of a TC-45J aircraft.

#### **Hamilton Little Liner**

- Modification of D.18S with aerodynamic improvements and new, retractable tail wheel, capable of carrying 11 seats.

#### **Hamilton Westwind**

- Turboprop conversions with various engines
  - **Westwind II STD** - two 840hp Pratt & Whitney Canada PT6A.
  - **Westwind III** - two 579hp P&W PT6-20 or 630hp PT6-27 or 630hp Lycoming LTS101.
  - **Westwind IV** - two 570hp Lycoming LTP-101 or 680hp P&W PT6-28 or 750hp P&W PT6A-34 or 1020hp P&W PT6A-45.

#### **Volpar (Beechcraft) Model 18**

- Conversion of Model 18 with nose wheel undercarriage.

#### **Volpar Super Turbo 18**

- 2x 705hp Garrett TPE331.

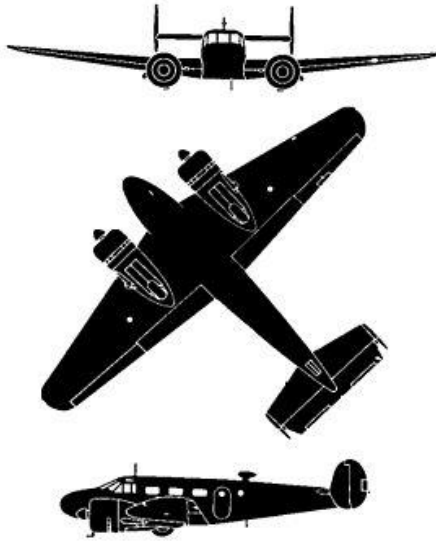
#### **Volpar C-45G**

- C-45G aircraft modified with tricycle undercarriage.

#### **Volpar Turboliner**

- Turboprop conversions of Beechcraft 18, 2x 705hp Garrett TPE331-1-101B.

## General characteristics (UC-45 Expeditor)



- **Crew:** 2 pilots
- **Capacity:** 6 passengers
- **Length:** 34 ft. 2 in (10.41 m)
- **Wingspan:** 47 ft. 8 in (14.53 m)
- **Height:** 9 ft. 8 in (2.95 m)
- **Wing area:** 349 ft<sup>2</sup> (32.4 m<sup>2</sup>)
- **Empty weight:** 6,175 lb. (2,800 kg)
- **Loaded weight:** 7,500 lb. (3,400 kg)
- **Max takeoff weight:** 8,727 lb. (3,959 kg)
- **Power plant:** 2 × Pratt & Whitney R-985-AN-1 "Wasp Junior" radial engines, 450 hp (336 kW) each

## Performance

- **Maximum speed:** 225 mph (195 knots, 360 km/h)
- **Range:** 1,200 mi (1,000 NM, 1,900 km) at 160 mph (260 km/h)
- **Service ceiling:** 26,000 ft. (7,930 m)
- **Rate of climb:** 1,850 ft./min (9.4 m/s)